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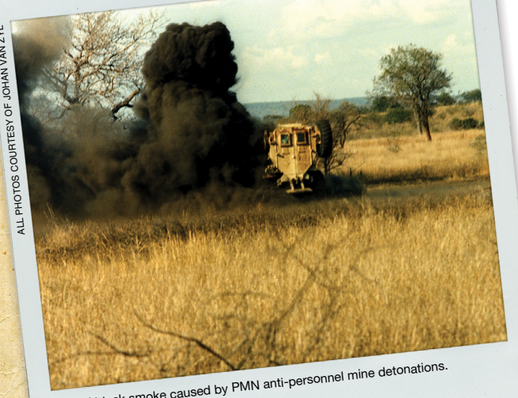
This down-in-the-trenches story about using a Casspir fitted with steel wheels to demine in Mozambique in the early 1990s makes you feel like you are right there. Getting rid of the mines was not the only problem the deminers had; sometimes getting past the insurgents was more challenging.



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Typical black smoke caused by PMN anti-personnel mine detonations.

During the early months of 1991, Garth Barrett and Brian Robinson, the directors of a South African-based security company called Minerva, negotiated a commercial mine clearance contract with *Electricidade de Mocambique*, the Mozambican national supplier of electrical power. Mozambique relied heavily on a 270-kilovolt power line that originated in the Highveld of South Africa and supplied the Mozambican capital, Maputo, with electricity. Both Barrett and Robinson were renowned soldiers in the former Rhodesia (now known as Zimbabwe) and were successively the commanding officers of C Squadron, Special Air Service in the last years of the civil war in the country. They had a long-standing research and development relationship with Mechem, a South African defense-related company wholly owned by the government at that time.

The contract Minerva signed with EDM stipulated some mine clearance on sections of the power line that had been sabotaged by *Resistencia Nacional Mocambicana* (RENAMO), the rebel guerrilla force operating in Mozambique, before repairs to the line would be carried out. All the power pylons on the line were mined during two separate mine-laying operations by the government forces, *Frente de Libertacao de Mocambique* (FRELIMO), during the preceding years to protect the line from attack. These mines apparently did not deter the guerrillas as they regularly breached the minefields to blow up the pylons. In all, EDM identified 60 pylons that were down or partly down and prevented the continuous transfer of electricity from South Africa to Maputo Mozambique. At the time, the civil war in Mozambique was in full swing and would not end until October of the following year, 1992.

An Italian power-line-building company, *Sae Sadelmi*, had already been contracted to start restructuring the damaged sections by September 1991 and time was running out to meet this deadline. Since these events took place before Ottawa,[1] Copenhagen[2] or Bonn,[3] there were no standards for international humanitarian mine action to speak of and thus little or nothing in the line of civilian standard operating procedures for this type of work.

For the purpose of the contract, Mechem joined forces with Minerva and the manager of Mechem, Dr. Vernon P. Joynt (who would become quite well-known in years to come[4]), worked non-stop with his team to find a mechanical solution to clear the line as quickly and effectively as possible. He had designed steel wheels that were fitted to Casspir mine-resistant troop carriers, of which Mechem had a few, and used them to detonate anti-personnel mines by driving over them. The width of the wheels was changed a few times to attain the ideal balance between weight distribution and ground penetration. This method proved to be quite effective during trials, so Dr. Joynt decided it would form the basis of his mine-clearing technique.

Brown smoke, which was typical from PMN-2 explosions.

On Dr. Joynt's team was Theo van Dyk, who would also play a big role in Mechem's development on the road to becoming an international demining company over the 10 years that followed. The team designed a gas-bag system consisting of cylindrical plastic rolls that could be filled with an explosive gas and detonated by firing small-arms rounds through it. The downward pressure created by the gas explosion would detonate the majority of blast mines—or so we thought. The components were nothing but a mixture of ordinary domestic gas and oxygen, mixed in the right proportion to deliver an explosive combustion when detonated.

At this time, Rocky van Blerk and I were signed up to assemble a small team to carry out the contract. We selected Billy Botes, M. R. Celeste and Piet van Zyl to form the rest of the team. I went with one of the guys to the border for a first reconnaissance of our work area. At the Lebombo border post, we were met by the EDM representative, Mr. Fuad, who would be our liaison officer (and who could speak better English than we could speak Portuguese).

A civilian-chartered helicopter flew us to Moamba, a small garrison town halfway to Maputo, which would be our home for the next two months. Because of the war, the main road was not in use. For the first 20 kilometers (12 miles) after lift-off at the border post, we could see dozens of shot-up and burnt-out wrecks of cars on both sides of the road. At the time, there was a shortage of everything in Mozambique—except maybe bullets and mines—and our living quarters were basic, to say the least. An old hotel, unused for years except to house hundreds of gold-mine recruits on their way to Johannesburg, it had long been out of water and electricity but was in the process of being refurbished by EDM for our use. In spite of the obvious shortages—and the fact that not long before we were at war with each other—our hosts were trying their best to be accommodating and helpful.

On June 24, 1991, the small convoy of two Mambas, a Casspir and an armored South African military supply truck crossed the border to start the contract. At the time, we must have been the first South African deminers on any sort of commercial or humanitarian mine clearance project. Noticing the remains of several human bodies in the burnt-out cars along the road, we realized that we would be the only people using that road for some time.

We had little more than two months to complete the contract, and I have since wondered at our somewhat foolish optimism about success. On the first reconnaissance of the power line, Botes and I detonated a PMN-1[5] AP mine on one of the service roads. The Casspir was filled with FRELIMO soldiers who were to be our protection for the contract, and it was quite a task to stop them from firing their AK-47s[6] wildly into the bushes around the road. The AP mine had punched a neat, round hole about 10 centimeters (4 inches) in diameter through the tire and had dented the rim of the wheel. We decided it would be necessary to fit the steel wheels before we tried that again.

The areas around the pylons were heavily overgrown with brush (and even some trees), and it was obvious that little maintenance had taken place over the preceding years. The power lines hung limp and close to the ground, and it was clear that the distance from the cables to the steel-hulled Casspirs would be dangerously close to the 270-kilovolt line if it were in operation. The FRELIMO soldiers were telling horror stories about the number of soldiers already killed while trying to demine some pylons. Fuad assured us the power would be switched off at our request; several other agreements also had to be made to ensure that we could do our work every day.

First, we had to establish our relationship with FRELIMO as a whole company of its solders was assigned for our protection. They were suspicious, to say the least, of the bearded South Africans—who must have seemed somewhat abrasive. I could not blame them. South Africa was in the process of political reformation at the time and the apartheid government had supported RENAMO. Mozambique was economically devastated and there was a lot of justified bitterness. Fortunately, Celeste, a Congolese-born veteran of several wars in Africa, could speak fluent Portuguese, and he advocated for us on many occasions. We met a young *tenente-coronel* (lieutenant colonel), Ozorio Severiano, at the time the engineer commander of Maputo province, who would go on to become the first head of the *Comisao Nacional de Desminagem* (National Demining Commission), the first national organization for the coordination of mine clearance in Mozambique. This would later be changed to the current *Instituto Nacional de Desminagem* (National Institute for Demining).

Two T-54 tanks,[7] two BTR[8] armored cars and at least two platoons of soldiers accompanied us every day. To get going in the morning, we soon learned we had to get up at 4:30 a.m. for an hour's weight workout; then, after breakfast, we had to go around the garrison looking for the company commander to wake up his officers and men who were found all over the small town. Punctuality was not the best feature of that unit, and it was probably the most frustrating part of our task: getting everybody ready for the 10- to 20-kilometer (6–12-mile) trip to the worksite every morning.

None of the vehicles could start under its own power. Even the tanks were started with a push by the Casspir, cushioned by a truck tire between the two vehicles. One BTR had no starter motor and had to be towed at high speed around the outskirts of the town before it would start—towed at great speed behind the Casspir with an irate driver. Since the poor BTR driver had no way to signal to the Casspir driver that his car had started, he was usually easily recognizable for the rest of the day by his dust-covered features.

Although the convoy was never ambushed on our way to work, more than once we had to stop on the way back in the evening to remove mines laid for us during the day. Some of the soldiers had interesting habits. Vivid in my memory is a pair of comrades, one wearing the shell of a tortoise for a helmet and the other never to be seen without wearing a gas mask from 1936 that he had acquired somewhere. The first time I saw him, I got quite a fright when he suddenly appeared around a corner and gave me an insect-like stare from about 6 inches away.

Relying heavily on the practical natures of team members van Blerk, Boates and Piet van Zyl, we devised a method by

Early-model steel wheels had ribs welded across the surface of the wheel. Due to bumpy rides on hard surfaces, this was later changed to a tractor-type, off-set pattern, which worked well.

which we would traverse the minefield, running the steel-wheeled Casspir forward and backward, moving about half a wheel's width to the side for every run. The first mines exploding under the wheels took the side mirrors off, so Mechem had to devise some stronger fittings and blast-resistant mirrors as we were dependent on the mirrors for reversing accurately. After completing a full width of about 15 meters (16 yards) on either side of the pylon, we would start a diagonal run, to cross our previous tracks at 90 degrees. The sound of rapid explosions of hundreds of mines being detonated could be heard all day long, and the crew would be covered in black dust just from the first run. Areas of 40 meters by 40 meters (44 yards by 44 yards) around the pylons were cleared in this way, most of the mines detonating on the first sweep.

The majority of the mines that we encountered were PMN and Gyata[9] complemented by PMD-6,[10] PMN-2, M-969,[11] OZM-4[12] and OZM-72.[13] Many of the bounding mines were still fitted with serviceable tripwires and would detonate if the Casspir wheels passed close to the tripwire stakes. It was fun to sit inside the safety of the Casspir trying to guess where the mine was going to jump out and explode as we approached the tripwires.

Van Blerk, Celeste and I carried on experimenting with the gas bags under the curious glare of our guard. The idea was that we would unroll the bags under the legs of the pylons where the Casspir could not go to detonate the mines that were laid inside the four base legs of the pylons. We soon discovered something that Dr. Joynt had forgotten to tell us—and that many people apparently knew—that the mechanisms of the Soviet PMN-2 mine were not agreeable with this type of detonation method. Its built-in anti-blast mechanisms prevented it from being detonated by such fast-moving energy. PMN and PMD-6 mines readily detonated, but with the mix of mines that we faced, the gas-bag method was not reliable. Therefore, after being exposed to the gas bags, the areas inside the pylon legs were cleared by manual detection and prodding to make sure that no PMN-2 mines remained behind.

We destroyed an average of 200 mines around every pylon by these methods, but the actual number sometimes varied from pylon to pylon from about 80 to more than 300. There was no time to subject every area to a manual detection search or for a formal quality assurance procedure. We simply drove up and down, backwards and forwards until no more detonations occurred and then walked over the area to inspect it visually.

At the time, we had a total belief in our unsophisticated system that was obviously based on more than a bit of ignorance but was also enforced because of the limited time. There was more than a little satisfaction in the fact that five of us had destroyed more than 12,000 mines in less than two months.

Our medical bag was well-stocked, but casualty evacuation would be made by Casspir to the Republic of South Africa, as there was no air evacuation available for either the soldiers or us. Fortunately, the team had no accidents, but the medical bag was in demand on a regular basis when mines injured soldiers all over the district. The FRELIMO soldiers had less medical equipment and support than we did and seemed to accept their fate readily. We saw the horrific wounds caused by the PMN—with its charge of over 200 grams of TNT—on many occasions, when either soldiers or civilians were injured.

Once, van Blerk and Boates came across a RENAMO guerrilla who must have crawled at least a kilometer (0.62 mile) from where he detonated a mine to the main road. He was found with a leg missing. On another occasion, van Blerk and I heard an explosion about 500 meters (one-third of a mile) away, saw the cloud of dust and found a teenage girl who had just lost her leg to a PMN AP mine, with a crowd of village people standing around, unable to help her. We bandaged her up, fitted a saline drip, injected her with Sosegon (a pain medication), and managed to find a truck driver who was willing to drive her to a hospital in Maputo where she could hopefully recover.

RENAMO must have taken exception to us now for working with their enemy, because they started to ambush us whenever we moved without our army escort. Realizing that we were unarmed, they often ran to the side of the road and emptied their rifles at us from less than 10 meters (11 yards) away.

As the team leader, I had the task of attending the occasional meeting in Maputo, or driving to Komatipoort in South Africa every few days to fax our handwritten situation reports to Mechem in Pretoria. I was usually driving around on my own and must have made an attractive target, because by the end of that year, I had survived seven ambushes, once or twice by the skin of my teeth. On several occasions, the bulletproof windows or windscreen of the Mamba saved my life as bullets were stopped inches from my head. Once, however, I was driving a soft-skinned pickup truck when I hit an ambush in the Lebombo mountain pass and the civilian friend sitting next to me was shot in the leg. With two flat tires, we had to abandon the vehicle and escape, first on foot and later by a civilian truck that I commandeered. The next day, when van Blerk came to help me retrieve the pickup, we were shot at again in the same location.

On a few occasions, the garrison village of Moamba was half-heartedly attacked at night. Every gun and rifle would then return fire for the rest of the night. We would sit on the verandah of the top floor of our villa, watching the spectacular display of tracer bullets flying in all directions but mostly skyward. We knew that the next day would be a slow start because the soldiers would get little sleep that night.

Working seven-day weeks, we cleared the 60 pylons on time, and *Sadelmi* started rebuilding the line on the appointed day, September 1. Van Blerk, Boates and I would stay on for the next 18 months, assisting the Italian company in blasting holes for pylon foundations, making safe lanes and access routes, and generally enjoying the warm Mozambican hospitality.

See "References and Endnotes," page 107

Johan Van Zyl was the field manager—later project manager—on numerous Mechem projects for 10 years in Mozambique, Angola, Croatia and Bosnia-Herzegovina. He assisted with the recent Geneva International Centre for Humanitarian Demining mechanical study, and for the past three years he has been technical advisor to the Japan Alliance for Humanitarian Demining Support in Thailand.

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Endnotes

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